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picking it up again, why should we regard it as an incredibly extravagant assumption that a correspondingly large space is unconsciously travelled over when we walk from one side to the other of our granite block? As the glimpse which we get of some of the fixed stars is merely a ray of light which has taken many hundred years to reach us, why should it be an altogether unreasonable assumption that the light-ray from our granite block may take a good deal longer to reach us than we are aware of? As we know, from experiments with birds, that there are sounds too high-pitched for our ear to detect, is it not in every way natural to expect that there are dimensions which the eye cannot detect?

To sum up: As our inferences with regard to the material world are rather the result of the limitations of our faculties than limitations of so-called matter itself, are we not likely to get ahead faster in the effort to broaden our concepts, and with them our ability to form concepts, by modifying our inferences than by trying to project our inferences into an unknown dimension?

W. P. PREBLE.

New York, May 23.

#### H. Carvill Lewis's Work on the Glacial Phenomena.

The following communication from the wife of the late Professor Lewis seems to me worthy of publication, both out of respect to the writer and for the considerable amount of valuable information which it contains upon a subject that is now uppermost in the minds of a considerable portion of the geological world. I have no doubt that a large circle of your readers will read it with great interest.

G. F. WRIGHT.

Oberlin, Ohio, May 23.

PROFESSOR G. FREDERICK WRIGHT, LL.D.

Dear Sir:—YOUR valuable reprint from the *Journal of Science* for January, 1892, on "The Theory of an Inter-Glacial Submergence in England" was duly received this morning, and after a careful perusal of its contents I hasten to thank you for your courtesy in sending it.

The many questions relative to the causes and extent of the great glacial epoch have, with its accompanying phenomena, occupied a large share of my thoughts during the past twelve years, first, because of its surpassing interest and close connection with the solution of some of the most important physical and astronomical problems of the day; and, second, because I had the pleasure of sharing all my husband's ideas and plans and much of his field-work, from the day when he first made your acquaintance at the Boston meeting of the American Association, in August, 1880, to July 17, 1888, when, knowing the precarious nature of the malady which had attacked him, he gave all his unfinished manuscripts into my care, with the request, that, as I knew his inmost wishes in regard to them, I would see that they were all completed and published as they ought to be. The MS. for my husband's "Observations on the Glacial Phenomena of Great Britain"—so ably edited by the Rev. Dr. Crosskey of Birmingham, and covering 1,100 pages of foolscap, has been in Washington since July last awaiting publication. Had it been printed before the paper which you have so kindly sent me was written, I think you would have obtained a slightly different impression of my husband's later views from that expressed in the closing paragraphs.

As the importance of clear definition in scientific work of all kinds can hardly be overestimated, and as my husband's one wish was to learn the truth irrespective of theories, which he regarded merely as tentative hypotheses, to be thrown aside when they no longer served the purpose for which they had been constructed, I think that the term, "Correction of some of Professor Lewis's earlier working hypotheses," would give a clearer impression of the real state of the case than the phrase, "Correction of Professor Lewis's personal equation," which to the world in general implies a constant and known element of error in all that an observer sees or does, and which must be strictly accounted for in the sum-total of his work.

As no one could be more anxious than I am (except my husband himself) that all errors of whatever sort shall be promptly eliminated

from his life work, and as I have only too good reason for knowing the endless and varied misconceptions with regard to his views, which have naturally arisen from the fragmentary reports of his European observations that have hitherto been published, I think that it may aid not only yourself but the scientific world generally if I send you a short synopsis of his later opinions. These are briefly as follows:—

With regard to the terminal moraine in Pennsylvania, over the last third of which he enjoyed the great pleasure and advantage of your companionship, his opinion remained unchanged, that a well-defined moraine had throughout the State defined the line of the solid ice-front.

The varying line of bowlders, scattered about as plums over a pudding, found considerably south of the moraine at different points in the western portion of the State, and which you both decided to name "The Fringe," he at first suggested (see Report Z) had been caused by a projection of the upper layers of ice—which move more rapidly than those beneath them—over the lower layers, which, as the ice rose hundreds of feet higher than the moraine at its base, would naturally and in accordance with its proper motion project the bowlders on the surface lying beyond the moraine line.

This view, however, was merely a tentative one, as he himself confessed (see Report Z), and he abandoned it in 1886, as his investigation of the English glacial deposits drew toward a close.

From many similar instances of "fringe" observed in Great Britain, and also in Switzerland and northern Italy, he was thoroughly convinced that the phenomena in each case that he himself examined had been caused by the damming back of streams flowing toward the ice-front and forming bodies of water of varying size and depth, which he called "extra-moraine lakes."

Full details and diagrams relating to his studies of these will be found in the forthcoming volume, and also his application of them to the phenomena observed in western Pennsylvania, where like features occur. The deposit of bowlders over the beds and along the edges of these extra-moraine lakes he held to be largely due to the drifting and melting of detached bergs, or cakes of ice, from the foot of the glacier, in which the *débris* had been frozen, or on whose surfaces the bowlders had been perched.

I do not remember my husband at any time thinking that "the fringe was the remnant of an earlier and distinct glacial period," though in the Old World he found in many places very clear evidence of there having been an advance or retreat, and a second advance of the isolated or coalescing streams, which together gave rise to the phenomena of the great glacial period.

I do, however, recall his frequent statement that never in any of his personal observations in America, Ireland, Great Britain, Switzerland, or Italy had he found a single instance of a glacier, ancient or modern, which had not at the time of its greatest extension been marked by a moraine at the foot of the solid ice, though these moraines often showed the greatest variety of form, from a low, flat deposit of gravel, sand, or till, from a few feet to a mile in width, and from a tiny ridge over which a man could easily step to the gigantic drift hills of northern Italy.

Exceptions to these observations occurred in cases where the ice moved from the land into the sea, as on the south side of the Killarney ice-centre, on the west side of the Clare Mountains, and in other instances, of which he himself has left a full description. The moraine in some portions of western England was much disturbed by the alternate elevation, depression, and re-elevation of that section of the country during the period of maximum glaciation, which caused a mingling and interbedding of morainic and marine deposits. Special stress should here be laid upon my husband's qualifying expression, "in my own experience," for he never at any time denied that a glacier ever had existed, did now exist, or could exist in the future without being bounded by a terminal moraine; he simply said, "I, personally, have been unable to find one."

With regard to your own admirable work in the State of Ohio, and beyond it toward the Mississippi valley, where the ice-front had not been marked by any definable moraine,—owing to its having gradually lost momentum and become very much attenuated in passing over a long, wide, and gently sloping plain till practi-

cally nothing remained of it,—my husband was fully prepared to accept the conclusions to which you had been led for that particular section of the country, as you will see from the notes appended to his English work.

In Ohio a set of conditions occur wholly unlike anything which my husband himself had seen in his glacial work, and making the allowance for a different glacial behavior, such as these conditions demanded, he felt that your own opinion with regard to them was the most logical he could reach at that time. In England, Wales, and Ireland a terminal moraine everywhere bounded the absolute ends of the separate or coalescing tongues of ice, except, as I have stated, where the ice had passed off to sea, or the moraine deposits had been disturbed by contemporary or subsequent water action, of which, in either case, there was always more or less distinct evidence. The moraine lines mentioned in your paper are all given in full in my husband's sketch of "The Terminal Moraines of the Great Glaciers of England," published for the Meeting of the British Association in Manchester in September, 1887; and his later opinions as to the origin of the "fringe" will be found in a similar article on "Some Great Extra-Morainic Lakes in England and North America at the Time of Maximum Glaciation."

My husband distinctly held that the maximum submergence in the West of England had attained a depth of from 450 to 500 feet, but had not reached that of 1,000 feet or more, as claimed by some of the leading British geologists.

Another point to be emphasized is that in my husband's mind a terminal moraine showed the halting-place of the solid ice only at the time of its greatest extension, and did *not* define or limit the irregular drift-covered areas in many instances found lying beyond it, which were due to the action of drainage-streams, icebergs or the deposits in temporary lakes.

As I have elsewhere stated, the first and only instance my husband ever saw which led him to believe in the existence of a large ice-stream (whether local or otherwise remains to be determined), between which and the glacial epoch as vast an interval of time had elapsed as that which separates the glacial period from the present day, was found in the deposits on Frankley Hill, near Birmingham. It was his intention, had he remained in this world, to make a thorough re-examination of all England, lest similar deposits had elsewhere escaped his notice; but he never at any time associated the Frankley Hill till and gravel with the "fringe" of the glacial period, from which it was wholly distinct.

Permit me to say in closing that the unlimited courtesy and generosity shown me by Dr. Crosskey and many others among the English geologists—some of whom are entirely opposed to my husband's conclusions—are beyond all praise and any acknowledgment which it is in my power to give. If, when I have in future to turn to my own countrymen for aid in finishing my husband's MSS. relating to the geology of the New World, I experience even a fraction of the kindness which has surrounded me in England, I shall have nothing left to desire.

#### CALENDAR OF SOCIETIES.

##### Philosophical Society, Washington.

May 21.—H. A. Hazen, Scientific Ballooning; Alexander S. Christie, The Method Employed to Find the Latitude-Variation Tide.

##### Publications Received at Editor's Office.

- ABBOTT, LYMAN. The Evolution of Christianity. Boston, Houghton, Mifflin & Co. 12°. 266 p. \$1.25.
- BAILEY, L. H. Cross-Breeding and Hybridizing. New York, Rural Pub. Co. 12°, paper. 44 p. 40 cts.
- HOLBROOK, M. L. The Hygienic Treatment of Consumption. New York, M. L. Holbrook & Co. 12°. 219 p.
- LYDEKKER, R. Phases of Animal Life Past and Present. New York, Longmans, Green & Co. 12°. 248 p. \$1.50.
- NEW JERSEY. Annual Report of the State Geologist for 1891. Trenton, J. L. Murphy Pub. Co., printers. 8°, paper. 270 p.

#### Societas Entomologica.

International Entomological Society, Zurich-Hottingen, Switzerland.  
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The Journal of the Society appears twice a month, and consists entirely of original articles on entomology, with a department for advertisements. All members may use this department free of cost for advertisements relating to entomology.

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For information address Mr. FRITZ RUHL, President of the Societas Entomologica, Zurich-Hottingen, Switzerland.

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For exchange.—A fine thirteen-keyed flute in leather covered case, for a photograph camera suitable for making lantern slides. Flute cost \$27, and is nearly new. U. O. COX, Mankato, Minn.

To exchange; Experiment Station bulletins and reports for bulletins and reports not in my file. I will send list of what I have for exchange. P. H. ROLFS, Lake City, Florida.

Finished specimens of all colors of Vermont marble for fine fossils or crystals. Will be given only for valuable specimens because of the cost of polishing. GEO. W. PERRY, State Geologist, Rutland, Vt.

For exchange.—Three copies of "American State Papers Bearing on Sunday Legislation," 1891, \$2.50, new and unused, for "The Sabbath," by Harmon Kingsbury, 1840; "The Sabbath," by A. A. Phelps, 1842; "History of the Institution of the Sabbath Day, Its Uses and Abuses," by W. L. Fisher, 1859; "Humorous Phases of the Law," by Irving Browne; or other works amounting to value of books exchanged, on the question of government legislation in reference to religion, personal liberty, etc. If preferred, I will sell "American State Papers," and buy other books on the subject. WILLIAM ADDISON BLAKELY, Chicago, Ill.

For Sale or Exchange for books a complete private chemical laboratory outfit. Includes large Becker balance (200g. to 1-10mg.), platinum dishes and crucibles, agate mortars, glass-blowing apparatus, etc. For sale in part or whole. Also complete file of *Silliman's Journal*, 1862-1885 (62-71 bound); Smithsonian Reports, 1854-1883; U. S. Coast Survey, 1854-1869. Full particulars to enquirers. F. GARDINER, JR., Pomfret, Conn.

Wanted, in exchange for the following works, any standard works on Surgery and on Diseases of Children: Wilson's "American Ornithology," 3 vols.; Coues' "Birds of the Northwest" and "Birds of the Colorado Valley," 2 vols.; Minot's "Land and Game Birds of New England"; Samuels' "Our Northern and Eastern Birds"; all the Reports on the Birds of the Pacific R. R. Survey, bound in 2 vols., Morocco; and a complete set of the Reports of the Arkansas Geological Survey. Please give editions and dates in corresponding. R. ELLSWORTH CALL, High School, Des Moines, Iowa.

To exchange Wright's "Ice Age in North America" and Le Conte's "Elements of Geology" (Copyright 1882) for "Darwinism," by A. R. Wallace, "Origin of Species," by Darwin, "Descent of Man," by Darwin, "Man's Place in Nature," Huxley, "Mental Evolution in Animals," by Romanes, "Pre-Adamites," by Winchell. No books wanted except latest editions, and books in good condition. C. S. Brown, Jr., Vanderbilt University, Nashville, Tenn.

#### Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, may have the "Want" inserted under this head FREE OF COST, if he satisfies the publisher of the suitable character of his application. Any person seeking information on any scientific question, the address of any scientific man, or who can in any way use this column for a purpose consonant with the nature of the paper, is cordially invited to do so.

WANTED.—By a young man, a Swarthmore College junior, a position as principal of a public high school in one of the Gulf States, or as instructor in botany, physiology, and geology in an academy or normal school. Address B., care of Librarian, Swarthmore College, Penn.

WANTED.—A teacher of Geology who is familiar with the fossils of the Hamilton Group, as instructor of Geology during July next at the Natural Science Camp on Canandaigua lake. Apply to ALBERT L. AREY, Director, 229 Averill Ave., Rochester, N. Y.

WANTED.—To act as correspondent for one or two daily or weekly papers. Have worked on paper for about two years. Would like a position on editorial staff of humorous paper. Address GEO. C. MASON, 14 Elm St., Hartford, Conn.

TRANSLATOR wanted to read German architectural works at sight (no writing). One familiar with technical terms desired. Address "A.," Box 149, New York Post Office.

WANTED.—A position in a manufacturing establishment by a manufacturing Chemist of inventive ability. Address M. W. B., care of Science, 874 Broadway, N. Y.

WANTED.—Books on Anatomy and Hypnotism. Will pay cash or give similar books in exchange. Also want medical battery and photo outfit. DR. ANDERSON, 182 State street, Chicago, Ill.

WANTED.—A college graduate with some normal training, to teach the sciences, at \$1,800 per year, in a Southern college. A Baptist or a Methodist preferred. Must also be a first-class Latin scholar. A. H. Beals, Box K, Milledgeville, Ga.

A PROFESSORSHIP in Chemistry is wanted by one who has had five years' experience in that capacity. Would prefer to give instruction by lectures and experiments rather than by text-book methods. Would like a position in a college or university where there is a good student's laboratory. Special points of strength claimed are: (1) Thorough control of a class and good order during lectures and recitations. (2) Accuracy in experimenting with chemicals and skill in the manipulation of chemical apparatus. The permission of several distinguished educators has been given to refer to them if required. Would not care to accept a position paying less than \$1,500. Address B. E., care of Science, 874 Broadway, New York.

ADDRESS WANTED.—Will some one please send the address of the Secretary of the American Philological Society. Also that of Herbert Spencer. "ADDISON," Room 84, 164 Madison St., Chicago, Ill.

As the publication of this letter may serve to elucidate my husband's views and to explain what his exact position was with regard to the leading questions of the day in glacial geology, pending the publication of his own work, I shall be greatly indebted if you will insert it at such a place in your detailed defense of his views as your own greater wisdom shall direct.

Again thanking you for your interesting and valuable paper, believe me to be, with regard,

Faithfully yours,

JULIA F. LEWIS.

Hotel Lang, Heidelberg.

#### AMONG THE PUBLISHERS.

THE fourth number of the "Columbia College Studies in Political Science," completing the first volume of that series of monographs, is entitled "The Financial History of Massachusetts from the Organization of the Massachusetts Bay Company to the American Revolution," by Charles H. J. Douglas, Ph.D., Seligman Fellow in Political Science in Columbia College. Doctor Douglas, before he returned East some four or five years ago to take charge of the work in history and English literature in the Brooklyn Boys' High School, was proprietor and managing editor of the *University*, a weekly literary and critical journal of Chicago, since merged in *Unity*, the well-known liberal religious weekly of that city. The *University*, during the two or three years of its separate existence, gained a high position as an inde-

pendent medium of scholarly discussion. Besides Doctor Douglas, then an instructor in the University of Wisconsin, its editorial staff included the late Professor Alexander Winchell, of the University of Michigan; Professor William H. Payne, now chancellor of the University of Nashville; Professor Charles K. Adams, lately president of Cornell University, and Professor George W. Knight, now of the Ohio State University, all of whom contributed to each number. Complete volumes of the *University* are now excessively rare.

—The next annual meeting of the Royal Society of Canada will be held at Ottawa on May 31 and following days, and will be opened with the usual inaugural address by the President, the Reverend Abbé Laflamme. Amongst the papers to be presented the following are of scientific interest: In the section of English literature a vocabulary of the language of the Beorhicks, or Red Indians of Newfoundland, by the Rev. Dr. Patterson, and a grammar and dictionary of the language of the Haida Indians of the Queen Charlotte Islands, by Rev. Chas. Hamilton of British Columbia; in the Physical section, "The Fundamental Hypothesis of Abstract Dynamics," by Professor J. G. MacGregor; "Long Columns," by Professor Bovey; and "On a New Form of Application Goniometer," by Professor Chapman; and in the Geological and Biological section, "The Fossils of the Hudson River Formation in Manitoba," by J. F. Whiteaves, and "On the Correlation of Early Cretaceous Floras in Canada and the United States, and on Some New Plants of this Period," by Principal Sir William Dawson.

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